d) $\varphi_S - \varphi_M = -\frac{\pi}{2} + 2k\pi \Leftrightarrow x = \left(k - \frac{1}{4}\right)\lambda$; $\left(k - \frac{1}{4}\right) \rangle 0 \Leftrightarrow k \rangle \frac{1}{4}$ deuxième point $\Rightarrow$ k = 2 $\Rightarrow x_2 = \frac{7}{4}\lambda = 0{,}35\ m$.

$x_2 = \frac{7}{4}\frac{C}{N} \Leftrightarrow N = \frac{7}{4}\frac{C}{x_2} = \frac{7}{4}\frac{10}{0{,}35} = 50\ Hz$

2)

a) a = 3.10^{-3}m. $\omega = 2\pi N = 100\pi$ rad.s^{-1}.

$y_{M3}(2{,}75T) = a = a\ Sin\left(\frac{2\pi}{T} \times 2{,}75T + \varphi_{M3}\right) \Leftrightarrow Sin\left(\varphi_{M3} - \frac{\pi}{2}\right) = 1$

$\Leftrightarrow \varphi_{M3} - \frac{\pi}{2} = \frac{\pi}{2} \Leftrightarrow \varphi_{M3} = \pi\ rad$, or M_3 et S sont en opposition de phase

$\Leftrightarrow \varphi_{M3} - \varphi_S = \pi \Leftrightarrow \varphi_S = 0$. $y_S(t) = 3.10^{-3}\ Sin\ (100\pi\ t)\ ; \forall\ t \geq 0$

y_S en (m) et t en (s).

b) $\begin{cases} y_{M3}(t) = \frac{a}{2} \\ \frac{dy_{M3}(t)}{dt} \rangle 0 \end{cases} \Leftrightarrow \begin{cases} Sin\left(\frac{2\pi}{T}t + \pi\right) = \frac{1}{2} \\ Cos\left(\frac{2\pi}{T}t + \pi\right) \rangle 0 \end{cases} \Leftrightarrow \frac{2\pi}{T} \times t + \pi = \frac{\pi}{6} + 2k\pi \Leftrightarrow$

$t = \frac{T}{2\pi}\left(-\frac{5\pi}{6} + 2k\pi\right) = \left(k - \frac{5}{12}\right)T$; t > 0 $\Leftrightarrow$ k > $\frac{5}{12} \Rightarrow$ k $\in$ N* ; Deuxième passage $\Rightarrow$ k = 2 ; $t = \left(2 - \frac{5}{12}\right)T = \frac{19}{12}T = 0{,}0316\ s$.

$y_{M_3}(t) = a\ Sin(\omega.t + \pi)\ \forall\ t \geq \theta_{M_3}$ or $v(t) = \frac{dy_{M_3}}{dt} = a.\omega\ Cos(\omega.t + \pi)\ \forall\ t \geq \theta_{M_3}$

pour t = $\frac{19}{12}T$ on a $v_{M_3} = a.\omega\ Cos\left(\frac{2\pi}{T}.\frac{19}{12}T + \pi\right) = a.\omega\ Cos\left(\frac{19\pi}{6} + \frac{6\pi}{6}\right) =$

$a.\omega\ Cos\left(4\pi + \frac{\pi}{6}\right) = a.\omega\ Cos\left(\frac{\pi}{6}\right) = 3.10^{-3} \times 100\pi \times \frac{\sqrt{3}}{2} = 0{,}15.\pi.\sqrt{3}$ m.s^{-1}.

Qarray.tn Agila Blech- Qarray.tn